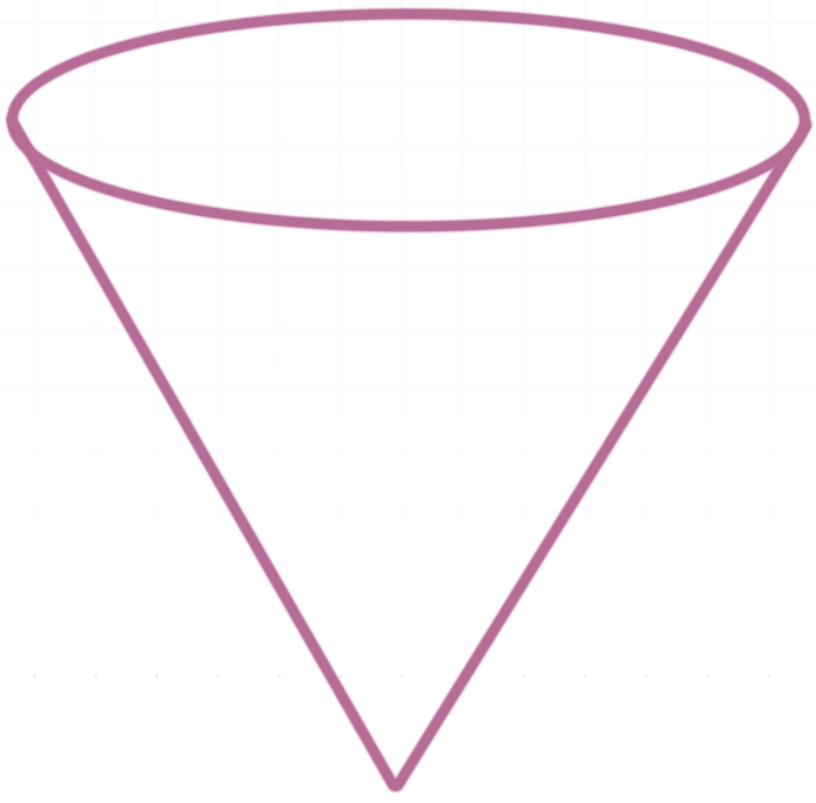
Nets/Volume/Surface area of cones

In this lesson we'll look at the nets, volume, and surface area of cones.

Cones

A cone has one circular base.



The net of a cone is a full circle for the base, and the a part of another circle for the wall of the cone.

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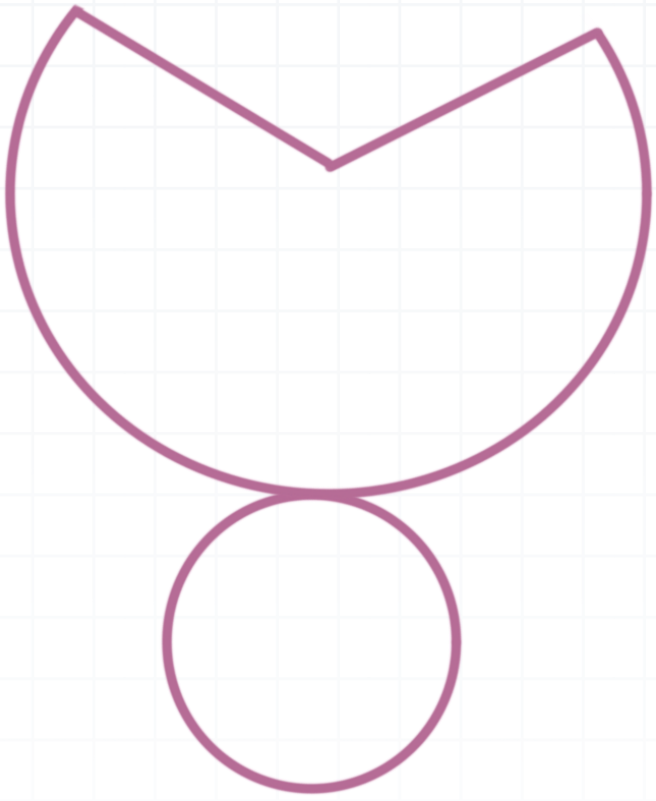
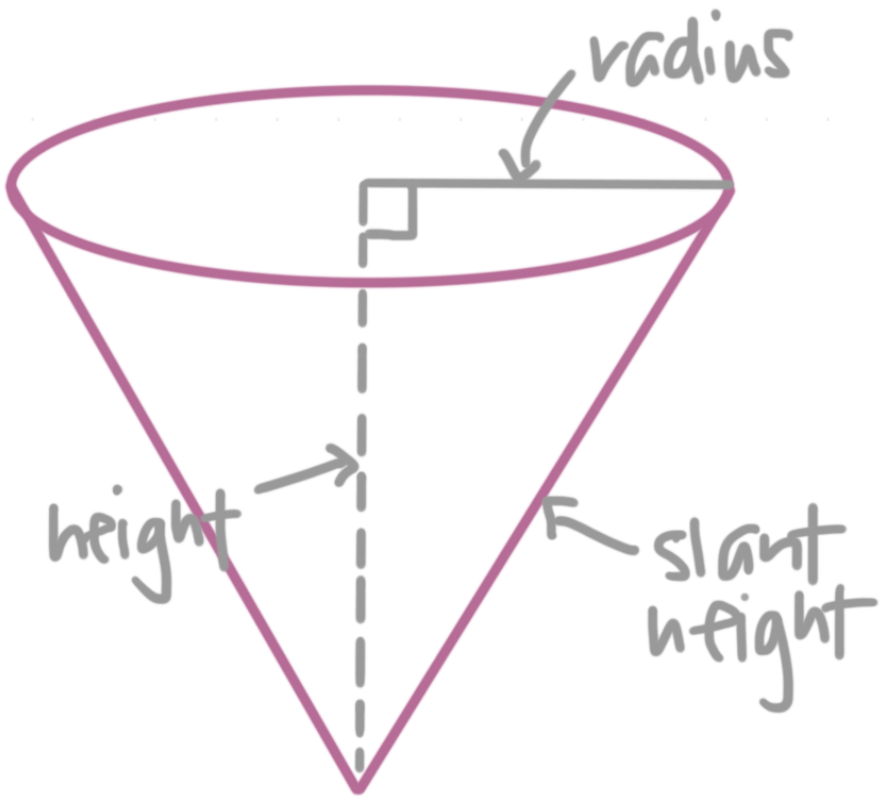


Parts of a cone

You'll need to know the parts of a cone.



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The radius r, height h, and slant height l of a cone are related by the Pythagorean Theorem.

$$r^2 + h^2 = l^2$$

Volume of a cone

The volume of a cone is given by

$$V = \frac{1}{3}\pi r^2 h$$

where r is the radius and h is the height of the cone.

Surface area of a cone

The surface area of a cone is given by

$$S = \pi r l + \pi r^2$$

where r is the radius and l is the slant height of the cone.

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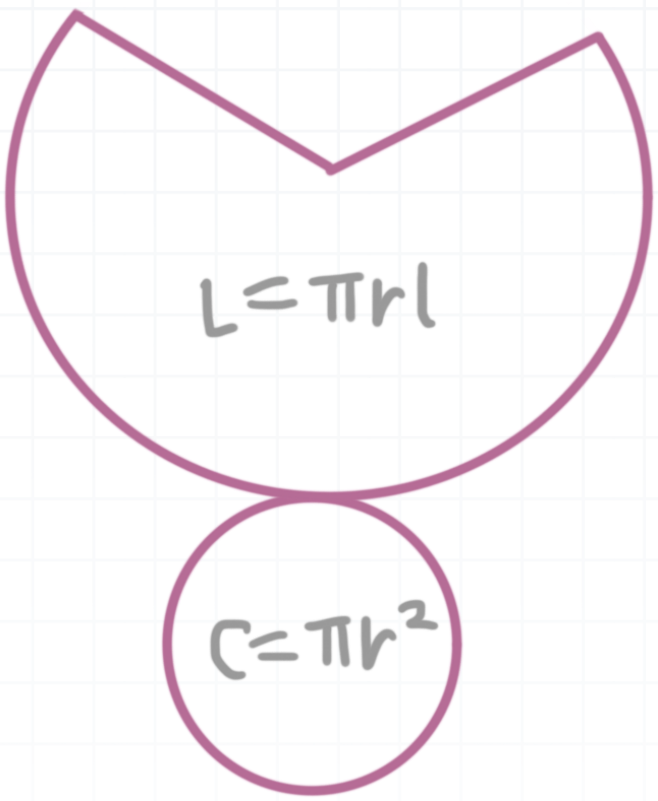

L is called the lateral area, so we can also write the surface area of the cone as

$$S = L + \pi r^2$$

Let's do a few examples.

Example

When the net of the cone is folded up, what is its surface area?

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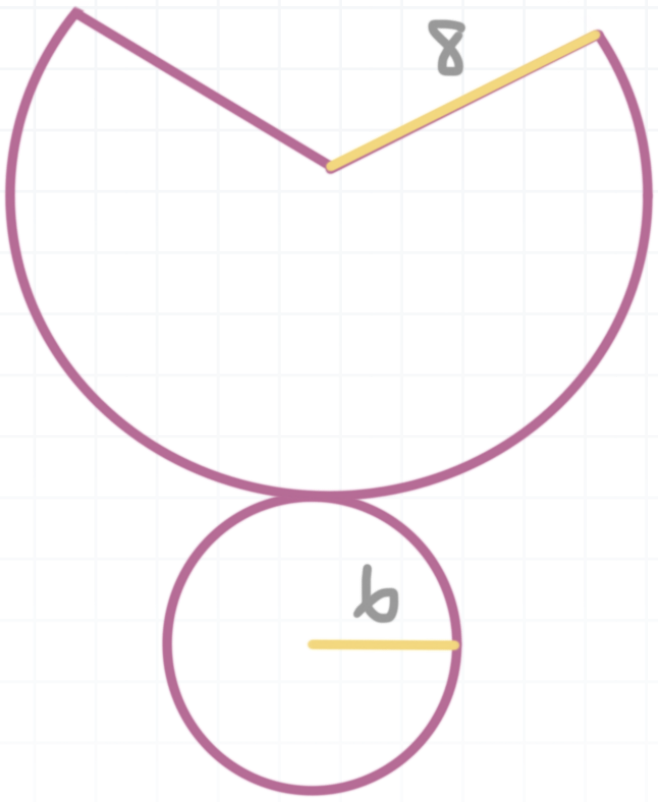

The formula for the surface area of a cone is

$$S = \pi rl + \pi r^2$$

In this case, the slant height is $l = 8$ and the radius is $r = 6$. Plugging these into the formula, we get

$$S = \pi rl + \pi r^2$$

$$S = \pi(6)(8) + \pi(6)^2$$

$$S = 48\pi + 36\pi$$

$$S = 84\pi \text{ units}^2$$

Let's do a few more examples.

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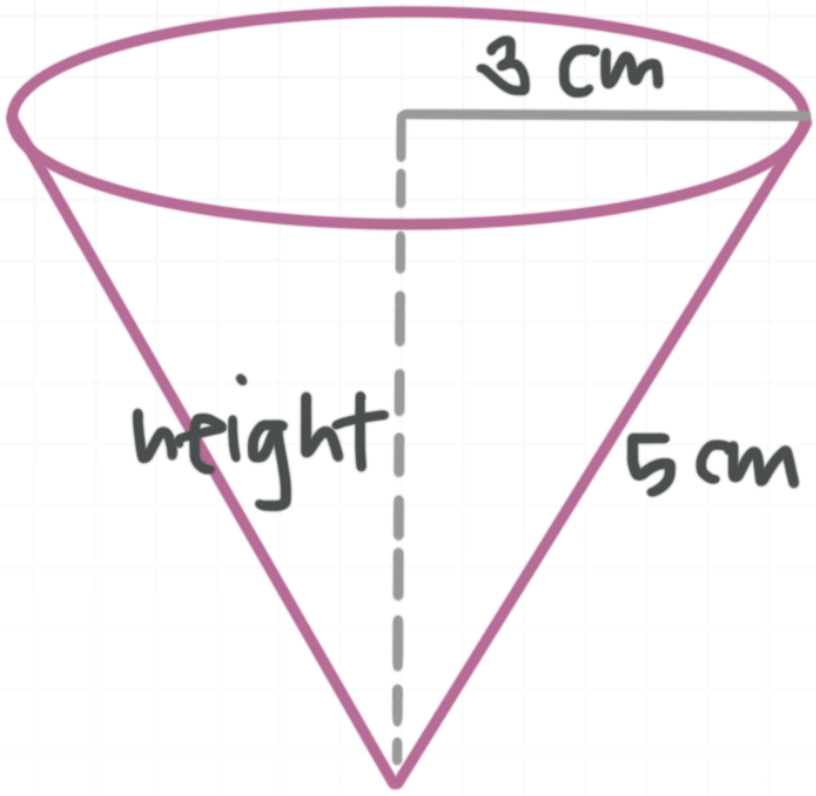
Example

What is the volume of the cone?



The formula for volume is

$$V = \frac{1}{3}\pi r^2 h$$

We already know the radius of the cone is 3 cm, and we need to find the height of the cone in order to find the volume. Remember, the radius, height, and slant height are related by the Pythagorean Theorem.

$$r^2 + h^2 = l^2$$

Plugging in, we get

$$3^2 + h^2 = 5^2$$

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$$9 + h^2 = 25$$

$$h^2 = 16$$

$$h = 4$$

Now we can use the volume formula.

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3}\pi(3)^2(4)$$

$$V = \frac{1}{3}(9)(4)\pi$$

$$V = 12\pi \text{ cm}^3$$

Let's do one more.

Example

What is the surface area of a cone with a slant height of 16.8 cm and a diameter of 16 cm? Use $\pi = 3.14$.

The formula for the surface area is

$$S = \pi rl + \pi r^2$$

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The slant height is $l = 16.8$. We can use the diameter to find the radius.

$$r = \frac{d}{2}$$

$$r = \frac{16}{2} = 8$$

The radius is $r = 8$. Plugging these values into the formula, we get

$$S = \pi rl + \pi r^2$$

$$S = 3.14(8)(16.8) + 3.14(8)^2$$

$$S = 622.976 \text{ cm}^2$$

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